

## Operating Instructions

### VEGAPULS 66 standpipe version

4 ... 20 mA/HART - four-wire



Document ID: 28742



**VEGA**

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### Safety instructions for Ex areas

Take note of the Ex specific safety instructions for Ex applications. These instructions are attached as documents to each instrument with Ex approval and are part of the operating instructions manual.

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# 1 About this document

## 1.1 Function

This operating instructions manual provides all the information you need for mounting, connection and setup as well as important instructions for maintenance and fault rectification. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

## 1.2 Target group

This operating instructions manual is directed to trained specialist personnel. The contents of this manual should be made available to these personnel and put into practice by them.

## 1.3 Symbols used



### Information, tip, note

This symbol indicates helpful additional information.



**Caution:** If this warning is ignored, faults or malfunctions can result.



**Warning:** If this warning is ignored, injury to persons and/or serious damage to the instrument can result.



**Danger:** If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.



### Ex applications

This symbol indicates special instructions for Ex applications.



### SIL applications

This symbol indicates instructions for functional safety which must be taken into account particularly for safety-relevant applications.

### • List

The dot set in front indicates a list with no implied sequence.

### → Action

This arrow indicates a single action.

### 1 Sequence of actions

Numbers set in front indicate successive steps in a procedure.



### Battery disposal

This symbol indicates special information about the disposal of batteries and accumulators.

## 2 For your safety

### 2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the plant operator.

During work on and with the device the required personal protective equipment must always be worn.

### 2.2 Appropriate use

VEGAPULS 66 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden.

### 2.3 Warning about incorrect use

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

### 2.4 General safety instructions

This is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.

Depending on the model, the emitting frequencies of all radar sensors are either in the C or K band range. The low transmitting power lies far below the internationally permitted limit values. When the instrument is used correctly, it presents no danger to human health. It may be operated without restriction outside of closed metallic vessels.

The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for trouble-free operation of the instrument.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

### 2.5 Safety label on the instrument

The safety approval markings and safety tips on the device must be observed.

## 2.6 CE conformity

The device fulfills the legal requirements of the applicable EC guidelines. By affixing the CE marking, we confirm successful testing of the product.

You can find the CE Certificate of Conformity in the download section of our homepage.

### Electromagnetic compatibility

The instruments are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with a class A instrument according to EN 61326-1. If the instrument is used in a different environment, its electromagnetic compatibility with other devices must be ensured by suitable measures.

## 2.7 Fulfilment of NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfills the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for malfunction information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components

For further information see [www.namur.de](http://www.namur.de).

## 2.8 FCC and IC conformity (only for USA/Canada)

VEGAPULS 66 is FCC and IC approved:

- FCC ID: O6QPULS6566
- IC: 3892A-PS6566

Modifications not expressly approved by VEGA will lead to expiry of the operating licence according to FCC.

VEGAPULS 66 is in conformity with part 15 of the FCC regulations. Take note of the respective operating regulations:

- This device may not cause interference, and
- This device must accept any interference, including interference that may cause undesired operation of the device

The instrument was tested and meets the limit values for a digital instrument of class B, according to part 15 of the FCC regulations. The limit values are predefined to ensure protection against interfering emissions during operation in industrial environments.

The instrument can generate, use and emit high frequency energy and can generate interfering emissions if not used as described in the operator's manual. Because interfering emissions have to be reckoned with when the instrument is used in residential areas, the user must make sure necessary countermeasures are implemented.

## 2.9 Environmental instructions

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified according to DIN EN ISO 14001.

Please help us fulfill this obligation by observing the environmental instructions in this manual:

- Chapter "*Packaging, transport and storage*"
- Chapter "*Disposal*"

## 3 Product description

### 3.1 Configuration

#### Scope of delivery

The scope of delivery encompasses:

- Radar sensor
- Documentation
  - Quick setup guide VEGAPULS 66
  - Instructions for optional instrument features
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - if necessary, further certificates
- DVD "*Software*", included therein
  - PACTware/DTM Collection
  - Driver software



#### Information:

In this operating instructions manual, the optional instrument features are described. The respective scope of delivery results from the order specification.

#### Constituent parts

The VEGAPULS 66 consists of the components:

- Process fitting with standpipe antenna
- Housing with electronics
- Housing cover, optionally available with display and adjustment module PLICSCOM

The components are available in different versions.



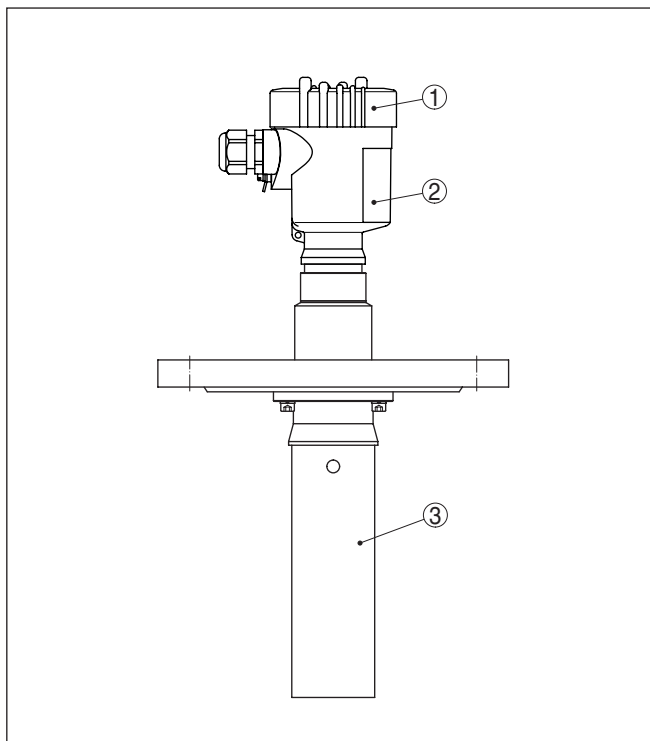


Fig. 1: VEGAPULS 66 in flange version up to 150 °C with plastic housing

- 1 Housing cover with integrated PLICSCOM (optional)
- 2 Housing with electronics
- 3 Process fitting with standpipe antenna

## Type label

The type label contains the most important data for identification and use of the instrument:

- Instrument type
- Article and serial number device
- Article numbers, documentation
- Technical data: Approvals, antenna type, process fitting, process seal/temperature, signal output, voltage supply, protection, protection class
- SIL identification (with SIL rating ex works)

With the serial number, you can access the delivery data of the instrument via [www.vega.com](http://www.vega.com), "VEGA Tools" and "serial number search". You can find the serial number on the inside of the instrument as well as on the type label on the outside.

## Scope of this operating instructions manual

This operating instructions manual applies to the following instrument versions:

- Hardware version < 2.0.0

- Software version  $\leq 3.8$

### 3.2 Principle of operation

#### Area of application

VEGAPULS 66 is a radar sensor in C-band (emitting frequency approx. 6 GHz) for continuous level measurement.

A special version of VEGAPULS 66 is available for each area of application. The version with flange and standpipe is particularly suitable for the measurement of solvents and liquid gases.

The standpipe antenna is also suitable for vessels with foam generation or for measurement of products with low dielectric figures ( $DK > 1.6$ ).

Measurement in a standpipe is not recommended for extremely adhesive products.

For pressures up to 160 bar (2320 psi) and temperatures up to 400 °C (752 °F) there are graphite seals and ceramic antenna cones available.

#### Functional principle

The antenna of the radar sensor emits short radar pulses with a duration of approx. 1 ns. These pulses are reflected by the product and received by the antenna as echoes. The transit time of the radar pulses from emission to reception is proportional to the distance and hence to the level. The determined level is converted into an appropriate output signal and outputted as measured value.

#### Voltage supply

Four-wire electronics with separate power supply.

The supply voltage range can differ depending on the instrument version.

The data for power supply are specified in chapter "*Technical data*".

Measured value transmission is carried out via the 4 ... 20 mA/HART output separate from power supply.

The backlight of the display and adjustment module is powered by the sensor. The prerequisite for this is a supply voltage at a certain level. The exact voltage specifications are stated in chapter "*Technical data*".

### 3.3 Packaging, transport and storage

#### Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test based on ISO 4180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

#### Transport

Transport must be carried out in due consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

## Transport inspection

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

## Storage

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

## Storage and transport temperature

- Storage and transport temperature see chapter "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 ... 85 %

## 3.4 Accessories and replacement parts

### PLICSCOM

The display and adjustment module PLICSCOM is used for measured value indication, adjustment and diagnosis. It can be inserted into the sensor and removed at any time.

You can find further information in the operating instructions "*Display and adjustment module PLICSCOM*" (Document-ID 27835).

### VEGACONNECT

The interface adapter VEGACONNECT enables the connection of communication-capable instruments to the USB interface of a PC. For parameter adjustment of these instruments, an adjustment software such as PACTware with VEGA-DTM is required.

You can find further information in the operating instructions "*Interface adapter VEGACONNECT*" (Document-ID 32628).

### VEGADIS 81

The VEGADIS 81 is an external display and adjustment unit for VEGA plics® sensors.

For sensors with double chamber housing the interface adapter "*DISADAPT*" is also required for VEGADIS 81.

You can find further information in the operating instructions "*VEGADIS 81*" (Document-ID 43814).

### VEGADIS 82

VEGADIS 82 is suitable for measured value indication and adjustment of sensors with HART protocol. It is looped into the 4 ... 20 mA/HART signal cable.

You can find further information in the operating instructions "*VEGADIS 82*" (Document-ID 45300).

## Protective cap

The protective cover protects the sensor housing against soiling and intense heat from solar radiation.

You will find additional information in the supplementary instructions manual "*Protective cover*" (Document-ID 34296).

## **Flanges**

Flanges are available in different versions according to the following standards: DIN 2501, EN 1092-1, ANSI B 16.5, JIS B 2210-1984, GOST 12821-80.

You can find additional information in the supplementary instructions manual "*Flanges according to DIN-EN-ASME-JIS*" (Document-ID 31088).

## **Electronics module**

Electronics module "VEGAPULS series 60" is a replacement part for radar sensors of VEGAPULS series 60. A different version is available for each type of signal output.

You can find further information in the operating instructions "*Electronics module VEGAPULS series 60*" (Document-ID 30176).

## 4 Mounting

### 4.1 General instructions

#### Installation position

Select an installation position you can easily reach for mounting and connecting as well as later retrofitting of a display and adjustment module. The housing can be rotated by 330° without the use of any tools. You can also install the display and adjustment module in four different positions (each displaced by 90°).

#### Moisture

Use the recommended cables (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give your instrument additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to outdoor mounting as well as installation in areas where high humidity is expected (e.g. through cleaning processes) or on cooled or heated vessels.

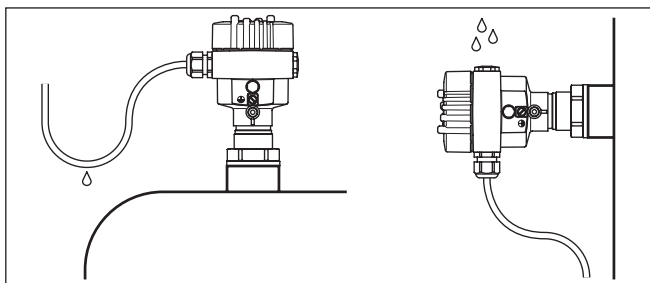


Fig. 2: Measures against moisture ingress

#### Cable entries - NPT thread

In the case of instrument housings with self-sealing NPT threads, it is not possible to have the cable entries screwed in at the factory. The free openings for the cable glands are therefore covered with red dust protection caps as transport protection.

Prior to setup you have to replace these protective caps with approved cable glands or close the openings with suitable blind plugs.

#### Measuring range

The reference plane for the measuring range is the lower edge of the flange or the seal surface of the thread. The measuring range extends from the vent hole in the standpipe below the reference plane up to the tube end.

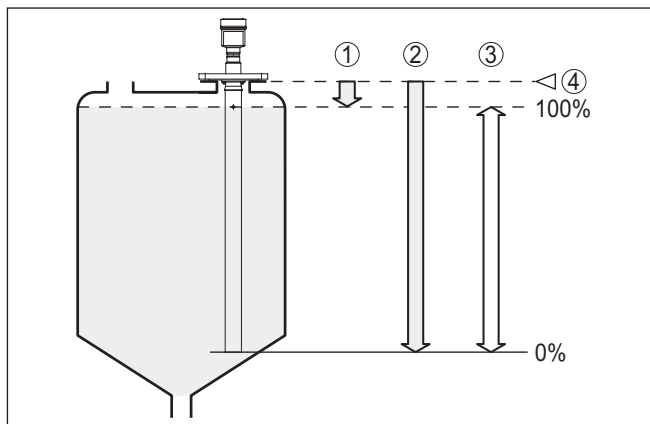


Fig. 3: Measuring range (operating range) and max. measuring distance

- 1 full
- 2 empty (max. measuring distance)
- 3 Measuring range

### Polarisation plane

The emitted radar impulses of VEGAPULS 66 are electromagnetic waves. The polarisation plane is the direction of the electrical share. Their position is marked on the instrument.

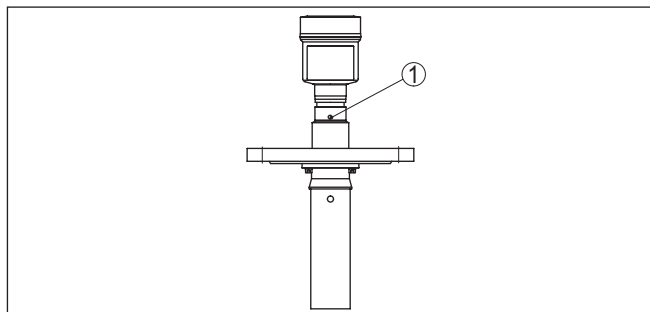


Fig. 4: Position of the polarisation plane of VEGAPULS 66

- 1 Marking hole

### Suitability for the process conditions

Make sure that all parts of the instrument coming in direct contact with the process, especially the sensor element, process seal and process fitting, are suitable for the existing process conditions, such as process pressure, process temperature as well as the chemical properties of the medium.

You can find the specifications in chapter "Technical data" and on the nameplate.

## Mounting

### 4.2 Mounting instructions

By using the standpipe version, the influence of turbulence and vessel installations, such as e.g. heating spirals or agitators, is excluded. If turbulence or vigorous product movement occurs in the vessel, long standpipe antennas should be fastened to the vessel wall.

The standpipe antenna must extend all the way down to the requested min. level, as measurement is only possible within the tube. If a good mixing of the product is important, you should use a version with perforated surge pipe.

If the flange of VEGAPULS 66 was separated from the tube during transport, make sure when mounting that the polarisation marking is in one plane to the vent hole. Take care that the plastic tip of the radar sensor is not damaged during transport.

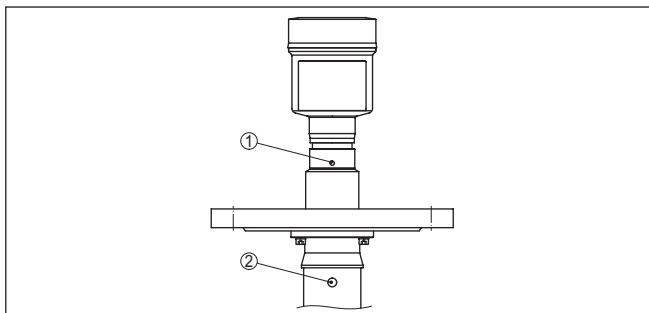


Fig. 5: Polarisation marking

- 1 Marking of the polarisation direction
- 2 Vent hole  $\varnothing$  8 mm (0.3 in)

## Inflowing medium

Do not mount the instruments in or above the filling stream.

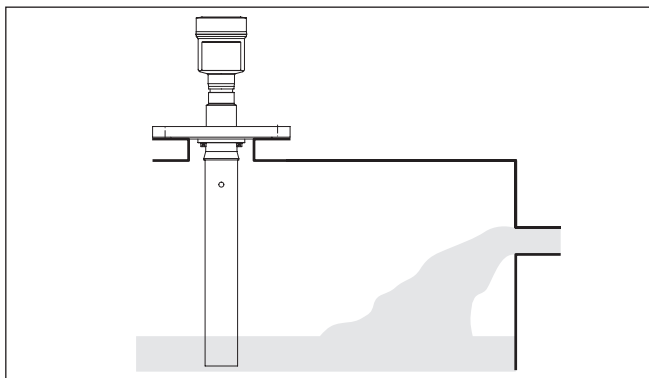


Fig. 6: Inflowing liquid

## 5 Connecting to power supply

### 5.1 Preparing the connection

#### Safety instructions

Always keep in mind the following safety instructions:



#### Warning:

Connect only in the complete absence of line voltage.

- The electrical connection must only be carried out by trained personnel authorised by the plant operator.
- If overvoltage surges are expected, overvoltage arresters should be installed.

#### Voltage supply

Supply voltage and current output are carried on separate two-wire connection cables if reliable separation is required. The supply voltage range can differ depending on the instrument version.

The data for power supply are specified in chapter "*Technical data*".

The standard version can be operated with an earth-connected current output, the Exd version must be operated with a floating output.

This instrument is designed in protection class I. To maintain this protection class, it is absolutely necessary that the ground conductor be connected to the internal ground terminal. Take note of the general installation regulations.

Always connect the instrument to vessel ground (potential equalisation) or in case of plastic vessels to the next ground potential. For this purpose there is a ground terminal on the side of the instrument housing.

#### Connection cable

For power supply, an approved installation cable with PE conductor is required.

The 4 ... 20 mA current output is connected with standard two-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Use cable with round cross section for instruments with housing and cable gland. To ensure the seal effect of the cable gland (IP protection rating), find out which cable outer diameter the cable gland is suitable for.

Use a cable gland fitting the cable diameter.

#### Cable screening and grounding

If screened cable is required, we recommend connecting the cable screen on both ends to ground potential. In the sensor, the screen must be connected directly to the internal ground terminal. The ground terminal on the outside of the housing must be connected to the ground potential (low impedance).



In Ex systems, the grounding is carried out according to the installation regulations.

With the Exd version, the minus side of the signal output is galvanically connected to ground via protective diodes. When connecting the instrument to a grounded PLC, equalising currents can flow in case



of potential differences which can cause malfunctions. Make sure that there is sufficient potential equalisation from the system side or realise the connection via switching amplifier.

In electroplating and CCP systems (cathodic corrosion protection) it must be taken into account that significant potential differences exist. This can lead to unacceptably high currents in the cable screen if it is grounded at both ends.



**Information:**

The metallic parts of the instrument (process fitting, housing, etc.) are conductively connected to the ground terminal.

## 5.2 Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. Loosen compression nut of the cable entry gland
3. Remove approx. 10 cm (4 in) of the cable mantle (current output), strip approx. 1 cm (0.4 in) insulation from the ends of the individual wires
4. Insert the cable into the sensor through the cable entry
5. Lift the opening levers of the terminals with a screwdriver
6. Insert the wire ends into the open terminals according to the wiring plan
7. Press down the opening levers of the terminals, you will hear the terminal spring closing
8. Check the hold of the wires in the terminals by lightly pulling on them
9. Connect the screen to the internal ground terminal, connect the outer ground terminal to potential equalisation
10. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
11. Connect the lead cable for power supply in the same way according to the wiring plan, in addition connect the ground conductor to the inner ground terminal.
12. Screw the housing lid back on

The electrical connection is finished.

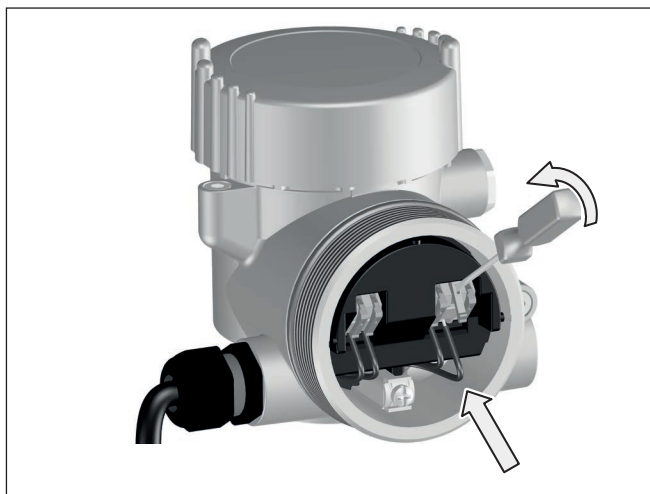


Fig. 7: Connection steps 5 and 6

### 5.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-d version.

#### Housing overview

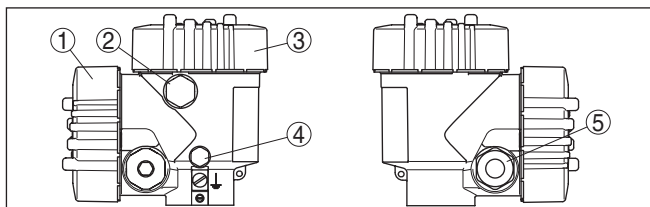


Fig. 8: Double chamber housing

- 1 Housing cover, connection compartment
- 2 Blind plug or plug M12 x 1 for VEGADIS 61 (optional)
- 3 Housing cover, electronics compartment
- 4 Filter element for air pressure compensation
- 5 Cable gland

### Electronics compartment

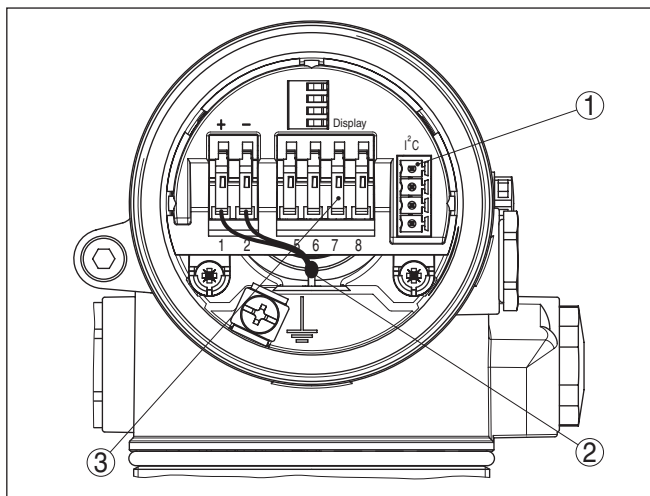


Fig. 9: Electronics compartment, double chamber housing

- 1 Plug connector for VEGACONNECT (I<sup>2</sup>C interface)
- 2 Internal connection cable to the connection compartment
- 3 Terminals for VEGADIS 81

### Terminal compartment

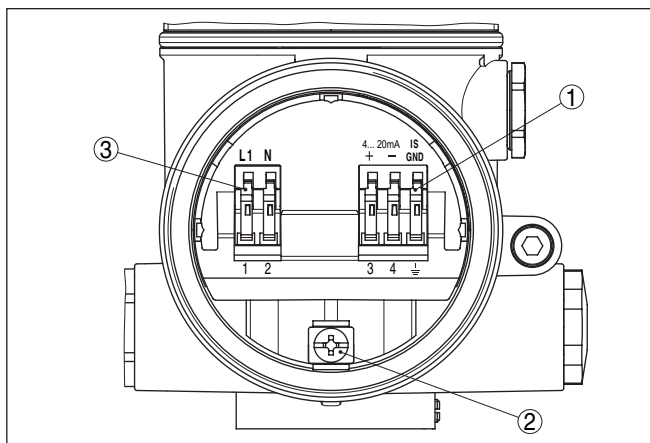


Fig. 10: Terminal compartment, double chamber housing

- 1 Spring-loaded terminals for signal output
- 2 Ground terminal for connection of the ground conductor and screen
- 3 Spring-loaded terminals for voltage supply



#### Information:

Keep in mind that the display and adjustment module must only be used in the electronics compartment.

## Wiring plan

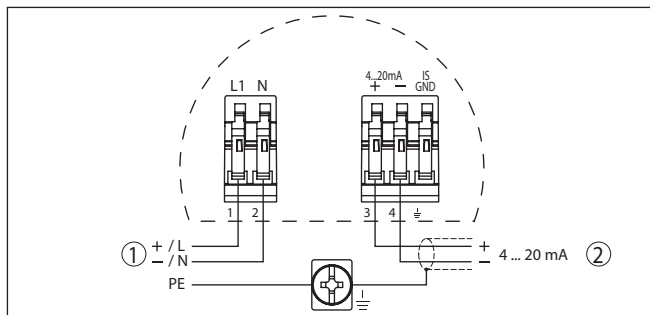


Fig. 11: Wiring plan, double chamber housing

- 1 Voltage supply
- 2 Signal output

## Switch-on phase

## 5.4 Switch-on phase

After connecting VEGAPULS 66 to power supply or after a voltage recurrence, the instrument carries out a self-check for approx. 30 seconds:

- Internal check of the electronics
- Indication of the instrument type, the firmware as well as the sensor TAGs (sensor designation)
- Output signal jumps briefly (approx. 10 seconds) to the set fault current

Then the corresponding current is outputted to the cable (the value corresponds to the actual level as well as the settings already carried out, e.g. factory setting).

## 6 Set up with the display and adjustment module PLICSCOM

### 6.1 Short description

#### Function/Configuration

The display and adjustment module is used for measured value display, adjustment and diagnosis. It can be mounted in the following housing versions and instruments:

- All continuously measuring sensors in single as well as double chamber housing (optionally in the electronics or connection compartment)
- External display and adjustment unit

### 6.2 Insert display and adjustment module

#### Mount/Dismount display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module in the desired position on the electronics (you can choose any one of four different positions - each displaced by 90°)
3. Press the display and adjustment module onto the electronics and turn it to the right until it snaps in
4. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.

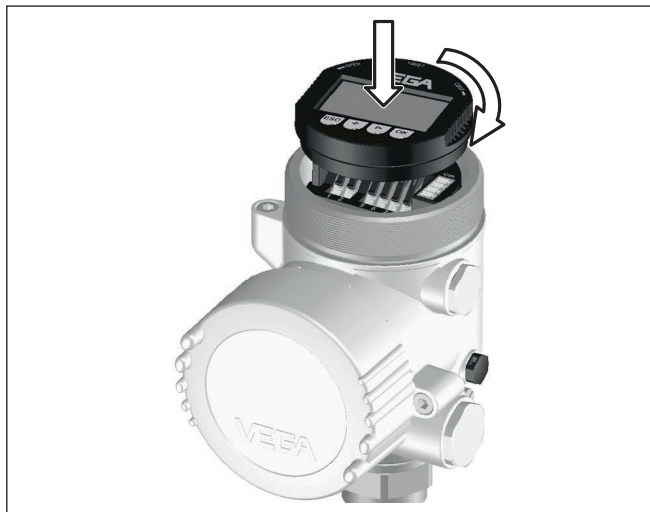


Fig. 12: Insert display and adjustment module

**Note:**

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

### 6.3 Adjustment system

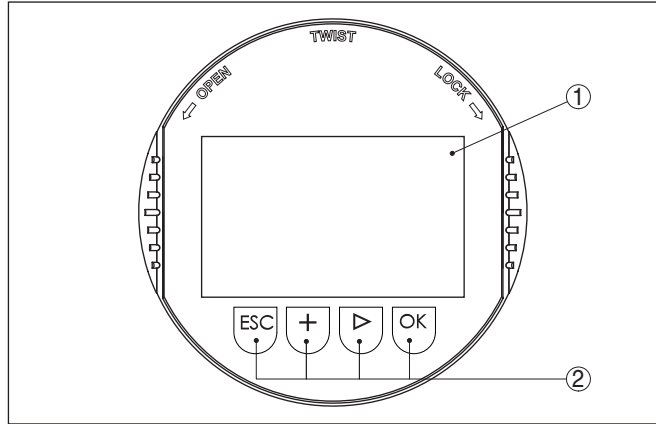


Fig. 13: Display and adjustment elements

- 1 LC display
- 2 Indication of the menu item number
- 3 Adjustment keys

#### Key functions

- **[OK]** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value
- **[→]** key to select:
  - Menu change
  - Select list entry
  - Select editing position
- **[+]** key:
  - Change value of the parameter
- **[ESC]** key:
  - Interrupt input
  - Jump to next higher menu

#### Adjustment system

You adjust the instrument via the four keys of the display and adjustment module. The individual menu items are shown on the LC display. You can find the functions of the individual keys in the previous illustration.

## Time functions

By pushing the **[+]** and **[->]** keys once, the edited value or the cursor changes by one position. By pushing the keys longer than 1 s the change will be continuously.

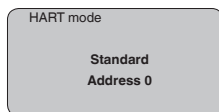
By pushing the **[OK]** and **[ESC]** keys simultaneously for more than 5 s, a return to the basic menu is caused. The menu language is then switched over to "English".

Approx. 60 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with **[OK]** will not be saved.

## 6.4 Setup steps

### Address setting HART multidrop

In HART-Multidrop mode (several sensors on one input) the address must be set before continuing with the parameter adjustment. You will find a detailed description in the operating instructions manual "Display and adjustment module" or in the online help of PACTware or DTM.



### Parameterization example

The radar sensor measures the distance from the sensor to the product surface. For indication of the real level, an allocation of the measured distance to the percentage height must be carried out.

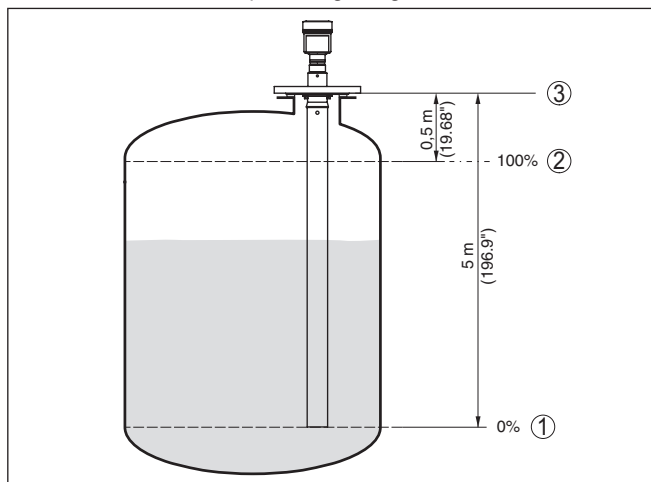


Fig. 14: Parameterization example

- 1 Min. level = max. measuring distance
- 2 Max. level = min. measuring distance

For this adjustment, the distance is entered when the vessel is full and nearly empty. If these values are not known, an adjustment with other distances, for example, 10 % and 90 % is also possible. Starting

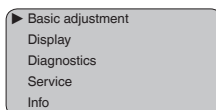
point for these distance specifications is always the seal surface of the thread or flange.

The real product level during this adjustment is not important, because the min./max. adjustment is always carried out without changing the product level. These settings can be made ahead of time without the instrument having to be installed.

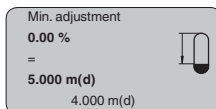
### Basic adjustment - Min. adjustment

Proceed as follows:

1. Move from the measured value display to the main menu by pushing **[OK]**.



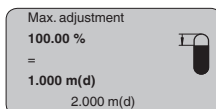
2. Select the menu item "Basic adjustment" with **[->]** and confirm with **[OK]**. Now the menu item "Min. adjustment" is displayed.



3. Prepare the % value for editing with **[OK]** and set the cursor to the requested position with **[->]**. Set the requested percentage value with **[+]** and save with **[OK]**. The cursor jumps now to the distance value.
4. Enter the suitable distance value in m for the empty vessel (e.g. distance from the sensor to the vessel bottom) corresponding to the percentage value.
5. Save the settings with **[OK]** and move to "Max. adjustment" with **[->]**.

### Basic adjustment - Max. adjustment

Proceed as follows:



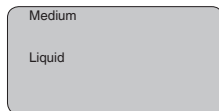
1. Prepare the % value for editing with **[OK]** and set the cursor to the requested position with **[->]**. Set the requested percentage value with **[+]** and save with **[OK]**. The cursor jumps now to the distance value.
2. Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. Keep in mind that the max. level must lie below the dead band.
3. Save the settings with **[OK]** and move to "Medium selection" with **[->]**.

### Basic adjustment - Medium selection

Each product has different reflective properties. In addition, there are various interfering factors which have to be taken into account: agitated product surfaces and foam generation (with liquids); dust



generation, material cones and echoes from the vessel wall (with solids). To adapt the sensor to these different conditions, you should first select "*Liquid*" or "*Solid*".



#### Information:

With VEGAPULS 66 with electronics version "*Increased safety*", "*Solid*" is preset as factory setting. However, the instrument should be used preferably in liquids. In such cases, the medium selection should be set to "*Liquid*" during setup.

According to the conductivity and the dielectric constant of liquids, the reflection properties can differ considerably. Therefore additional options such as "*Solvent*", "*Chem. mixture*" and "*Water based*" are offered below the menu item Liquid.

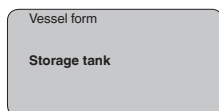
With solids, you can also choose between "*Powder/Dust*", "*Granular/Pellets*" or "*Ballast/Pebbles*".

Through this additional selection, the sensor is adapted perfectly to the product and measurement reliability, particularly in products with poor reflective properties, is considerably increased.

Enter the requested parameters via the appropriate keys, save your settings and jump to the next menu item with the [*->*] key.

#### Basic adjustment - Vessel form

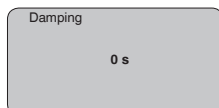
Apart from the medium, the vessel shape can also influence the measurement. To adapt the sensor to these measuring conditions, this menu item offers different options depending on whether liquid or bulk solid is selected. With "*Liquids*" these are "*Storage tank*", "*Stilling tube*", "*Open vessel*" or "*Stirred vessel*", with "*Solid*", "*Silo*" or "*Bunker*".



Enter the requested parameters via the appropriate keys, save your settings and jump to the next menu item with the [*->*] key.

#### Basic adjustment - Damping

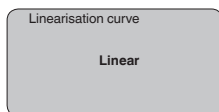
To suppress fluctuations in the measured value display, e. g. caused by an agitated product surface, a damping can be set. This time can be between 0 and 999 seconds. Keep in mind that the reaction time of the entire measurement will then be longer and the sensor will react to measured value changes with a delay. In general, a period of a few seconds is sufficient to smooth the measured value display.



Enter the requested parameters via the appropriate keys, save your settings and jump to the next menu item with the **[→]** key.

### Basic adjustment - Linearization curve

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank - and the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set in the menu item "Display".



Enter the requested parameters via the appropriate keys, save your settings and jump to the next menu item with the **[→]** key.



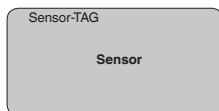
#### Caution:

Note the following if the VEGAPULS 66 with corresponding approval is used as part of an overflow protection system according to WHG (Water Resources Act):

If a linearisation curve is selected, the measuring signal is no longer necessarily linear to the filling height. This must be considered by the user especially when adjusting the switching point on the limit signal transmitter.

### Basic adjustment - Sensor TAG

In this menu item you can enter an unambiguous designation for the sensor, e.g. the measurement loop name or the tank or product designation. In digital systems and in the documentation of larger plants, a singular designation should be entered for exact identification of individual measuring points.



With this menu item, the Basic adjustment is finished and you can now jump to the main menu with the **[ESC]** key.

### Display - Displayed value

In the menu item "Display" you can define how the measured value should be presented on the display.

The following indication values are available:

- Height
- Distance
- Current
- Scaled
- Percent
- Lin. percent

The selection "*scaled*" opens the menu items "*Display unit*" and "*Scaling*". In "*Display unit*" there are the following options:

- Height
- Ground
- Flow
- Volume
- Without unit

Depending on selection, the different units are in turn available.

In the menu item "*Scaling*", the requested numerical value with decimal point is entered for 0 % and 100 % of the measured value.

There is the following relationship between the indication value in the menu "*Display*" and the adjustment unit in the menu "*Device settings*":

- Indication value "*Distance*": Presentation of the measured value in the selected adjustment unit, e.g. m(d).

Displayed value

Scaled ▼

Display unit

Volume ▼

l ▼

Scaling

0 % = 0.0 l

100 % = 100.0 l

### Display - Backlight

A background lighting integrated by default can be adjusted via the adjustment menu. The function depends on the height of the supply voltage. See "*Technical data/Voltage supply*".

Backlight

In the default setting, the lightning is switched off.

### Diagnosis - Peak value

The respective min. and max. measured values are saved in the sensor. The values are displayed in the menu item "*Peak values*".

- Min. and max. distance in m(d)
- Min. and max. temperature

Peak value indicator

**Diagnosis - Measurement reliability**

When non-contact level sensors are used, the measurement can be influenced by the respective process conditions. In this menu item, the measurement reliability of the level echo is displayed as dB value. The measurement reliability equals signal strength minus noise. The higher the value, the more reliable the measurement. With a functioning measurement, the values are > 10 dB.

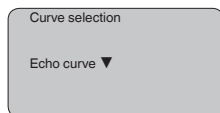
**Diagnosis - Curve selection**

With ultrasonic sensors, the **"Echo curve"** represents the signal strength of the echoes over the measuring range. The unit of signal strength is "dB". The signal strength enables the judgement of the quality of the measurement.

The **"False echo curve"** displays the saved false echoes (see menu **"Service"**) of the empty vessel as signal strength in "dB" over the measuring range.

Up to 3000 measured values are recorded (depending on the sensor) when starting a **"Trend curve"**. Then the values can be displayed on a time axis. The oldest measured values are always deleted.

In the menu item **"Choose curve"**, the respective curve is selected.

**Information:**

The trend recording is not activated when being shipped. It must be started by the user via the menu item **"Start trend curve"**.

**Diagnosis - Curve presentation**

A comparison of the echo curve and the false echo curve allows a more detailed evaluation of measurement reliability. The selected curve is updated continuously. With the **[OK]** key, a submenu with zoom functions is opened.

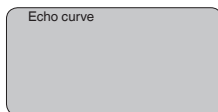
The following functions are available with **"Echo and false echo curve"**:

- "X-Zoom": Zoom function for the meas. distance
- "Y-Zoom": 1, 2, 5 and 10x signal magnification in "dB"
- "Unzoom": Reset the presentation to the nominal measuring range without magnification

In the menu item **"Trend curve"** the following are available:

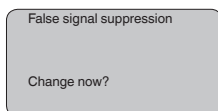
- "X-Zoom": Resolution
  - 1 minute
  - 1 hour
  - 1 day
- "Stop/Start": Interrupt a recording or start a new recording
- "Unzoom": Reset the resolution to minutes

As default setting, the recording pattern has 1 minute. With the adjustment software PACTware, this pattern can be also set to 1 hour or 1 day.



## Service - False signal suppression

High sockets or vessel installations, such as e. g. struts or agitators as well as buildup and weld joints on the vessel walls, cause interfering reflections which can impair the measurement. A false echo storage detects and marks these false echoes, so that they are no longer taken into account for the level measurement. A false echo memory should be created with low level so that all potential interfering reflections can be detected.



Proceed as follows:

1. Move from the measured value display to the main menu by pushing **[OK]**.
2. Select the menu item "Service" with **[->]** and confirm with **[OK]**. Now the menu item "False signal suppression" is displayed.
3. Confirm "False signal suppression - Change now" with **[OK]** and select in the below menu "Create new". Enter the actual distance from the sensor to the product surface. All false signals in this area are detected by the sensor and saved after confirming with **[OK]**.

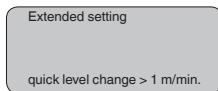


### Note:

Check the distance to the product surface, because if an incorrect (too large) value is entered, the existing level will be saved as a false signal. The level would then no longer be detectable in this area.

## Service - Extended setting

The menu item "Extended setting" offers the possibility to optimise VEGAPULS 66 for applications in which the level changes very quickly. To do this, select the function "Quick level change > 1 m/min."



### Note:

Since with the function "Quick level change > 1 m/min." the generation of an average value of the signal processing is considerably reduced, false reflections by agitators or vessel installations can cause measured value fluctuations. A false echo memory is thus recommended.

## Service - Current output

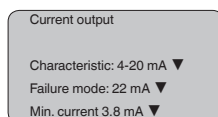
In the menu item "Current output" you determine the behaviour of the current output during operation and in case of failure. The following options are available:

**Current output**

Characteristics	<b>4 ... 20 mA</b> 20 ... 4 mA
Failure mode <sup>1)</sup>	Hold value 20.5 mA 22 mA <b>&lt; 3.6 mA</b>
Min. current <sup>2)</sup>	<b>3.8 mA</b> 4 mA
Max. current <sup>3)</sup>	<b>20 mA</b> 20.5 mA

The values in bold font represent the data of the factory setting.

In HART multidrop mode, the current is constantly 4 mA. This value does not change even in case of failure.

**Service - Simulation**

In this menu item you simulate a user-defined level or pressure value via the current output. This allows you to test the signal path, e.g. through connected indicating instruments or the input card of the control system.

The following simulation variables are available:

- Percent
- Current
- Pressure (with pressure transmitters)
- Distance (with radar and guided microwave)

With Profibus PA sensors, the selection of the simulated value is made via the "Channel" in the menu "*Basic adjustments*".

How to start the simulation:

1. Push **[OK]**
2. Select the requested simulation variable with **[>]** and confirm with **[OK]**.
3. Set the requested numerical value with **[+]** and **[>]**.
4. Push **[OK]**

The simulation is now running, with 4 ... 20 mA/HART a current is outputted and with Profibus PA or Foundation Fieldbus a digital value.

How to interrupt the simulation:

→ Push **[ESC]**

<sup>1)</sup> Value of the current output in case of failure, e.g. if no valid measured value is delivered.

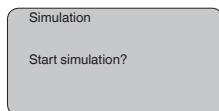
<sup>2)</sup> This value is not underrun during operation.

<sup>3)</sup> This value is not exceeded during operation.



### Information:

The simulation is automatically terminated 10 minutes after the last pressing of a key.



## Service - Reset

### Basic adjustment

If the "Reset" is carried out, the sensor resets the values of the following menu items to the reset values (see chart):<sup>4)</sup>

Menu item	Reset value
Max. adjustment	0 m(d)
Min. adjustment	Meas. range end in m(d) <sup>5)</sup>
Medium	Liquid
Vessel form	not known
Damping	0 s
Linearization	Linear
Sensor-TAG	Sensor
Displayed value	Distance
Extended settings	None
Current output - characteristics	4 ... 20 mA
Current output - max. current	20 mA
Current output - min. current	4 mA
Current output - failure	< 3.6 mA
Unit of measurement	m(d)

The values of the following menu items are *not* reset to the reset values (see chart) with "Reset":

Menu item	Reset value
Backlight	No reset
Language	No reset
SIL	No reset
HART mode	No reset

### Default setting

Like basic adjustment, but in addition, special parameters are reset to default values.<sup>6)</sup>

### Peak value indicator

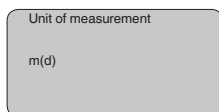
The min. and max. distance values are reset to the actual value.

<sup>4)</sup> Sensor-specific basic adjustment.

<sup>5)</sup> Depending on the sensor type, see chapter "Technical data".

<sup>6)</sup> Special parameters are parameters which are set customer-specifically on the service level with the adjustment software PACTware.

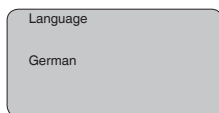
**Service - Adjustment unit** In this menu item you select the internal arithmetic unit of the sensor.



### Service - Language

The sensor is already set to the ordered national language. In this menu item you can change the language. The following languages are available, e.g. in software version 3.50:

- Deutsch
- English
- Français
- Espanol
- Pycckuu
- Italiano
- Netherlands
- Japanese
- Chinese



### Service - SIL

The functional safety is already activated Ex factory for instruments with SIL qualification. For instruments Ex factory without SIL qualification, the functional safety must be activated by the user for applications according to SIL via the indicating and adjustment module. The SIL factory setting cannot be deactivated by the user.

The activation of SIL has the following impact:

- In the menu item "*Failure mode*" under "*Current output*", the parameters "*Hold value*" and "*20.5 mA*" are blocked
- In the menu item "*HART mode*", the function "*Multidrop*" is blocked



#### Note:

For such applications, it is absolutely necessary to take note of "*Safety Manual*".

### Service - HART mode

HART offers standard and multidrop mode.

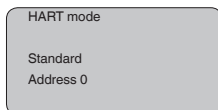
The mode standard with the fixed address 0 means output of the measured value as 4 ... 20 mA signal.

In Multidrop mode, up to 15 sensors can be operated on one two-wire cable. An address between 1 and 15 must be assigned to each sensor.<sup>7)</sup>

In this menu item you determine the HART mode and enter the address for multidrop.

<sup>7)</sup> The 4 ... 20 mA signal of the HART sensor is switched off. The sensor consumes a constant current of 4 mA. The measuring signal is transmitted exclusively as digital HART signal.





The default setting is standard with address 0.

## Copy sensor data

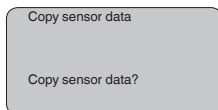
This function enables reading out parameter adjustment data as well as writing parameter adjustment data into the sensor via the display and adjustment module. A description of the function is available in the operating instructions manual "*Display and adjustment module*".

The following data are read out or written with this function:

- Measured value presentation
- Adjustment
- Medium
- Inner diameter of the standpipe (with standpipe versions)
- Vessel form
- Damping
- Linearisation curve
- Sensor-TAG
- Displayed value
- Display unit
- Scaling
- Current output
- Unit of measurement
- Language

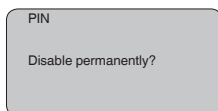
The following safety-relevant data are **not** read out or written:

- HART mode
- PIN
- SIL



## Service - PIN

In this menu item, the PIN is activated/deactivated permanently. Entering a 4-digit PIN protects the sensor data against unauthorized access and unintentional modifications. If the PIN is activated permanently, it can be deactivated temporarily (i.e. for approx. 60 min.) in any menu item. The instrument is delivered with the PIN set to 0000.



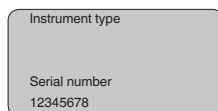
Only the following functions are permitted with activated PIN:

- Select menu items and show data
- Read data from the sensor into the display and adjustment module.

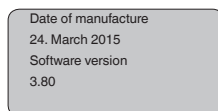
**Info**

In this menu item the most important sensor information can be displayed:

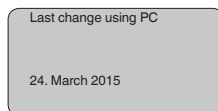
- Instrument type
- Serial number: 8-digit number, e.g. 12345678



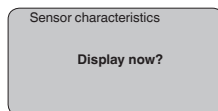
- Date of manufacture: Date of the factory calibration, e.g. 24. March 2015
- Software version: Edition of the sensor software, e.g. 3.80



- Date of last change using PC: Date of the last change of sensor parameters via PC, e.g. 24. March 2015



- Sensor details, e.g. approval, process fitting, seal, measuring cell, measuring range, electronics, housing, cable entry, plug, cable length etc.



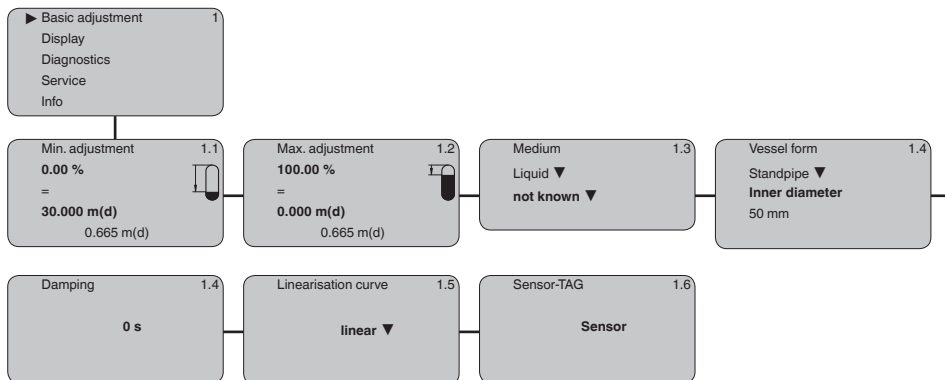
## 6.5 Menu schematic



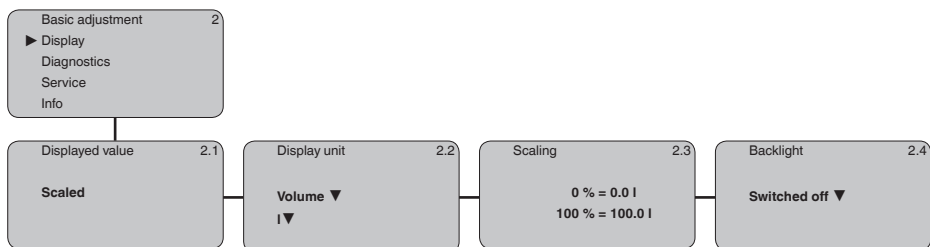
### Information:

Depending on the version and application, the light-coloured menu windows are not always available or offer no selection possibility.

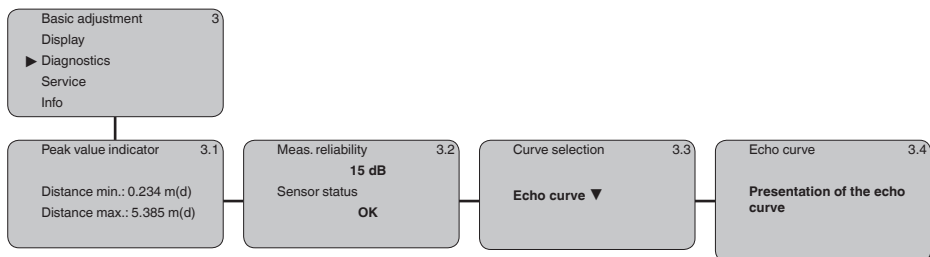
### Basic adjustment



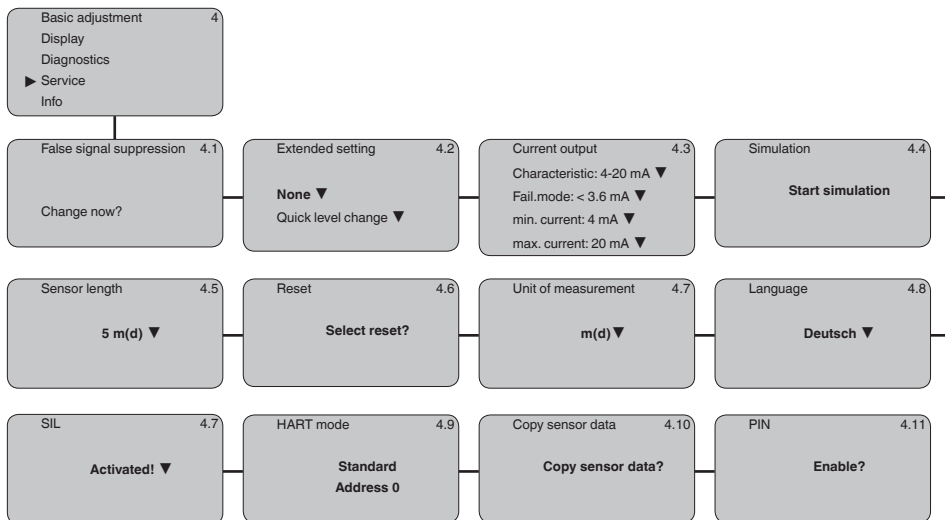
### Display



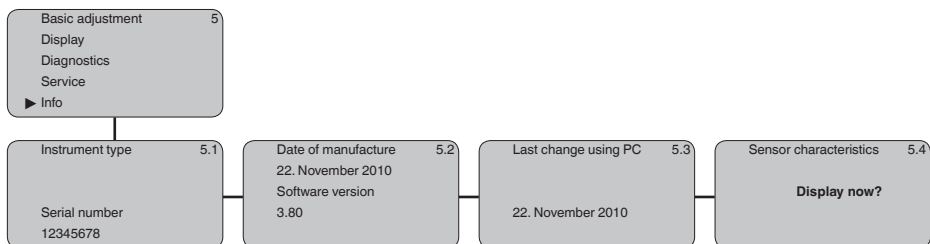
### Diagnostics



## Service



## Info



## 6.10 Saving the parameter adjustment data

We recommend noting the adjusted data, e.g. in this operating instructions manual, and archiving them afterwards. They are thus available for multiple use or service purposes.

If VEGAPULS 66 is equipped with a display and adjustment module, the most important data can be read out of the sensor into the display and adjustment module. The procedure is described in the operating instructions manual "*Display and adjustment module*" in the menu item "*Copy sensor data*". The data remain there permanently even if the sensor power supply fails.

If it is necessary to exchange the sensor, the display and adjustment module is inserted into the replacement instrument and the data are written into the sensor under the menu item "*Copy sensor data*".

## 7 Set up with PACTware and other adjustment programs

### 7.1 Connect the PC

**VEGACONNECT directly on the sensor**

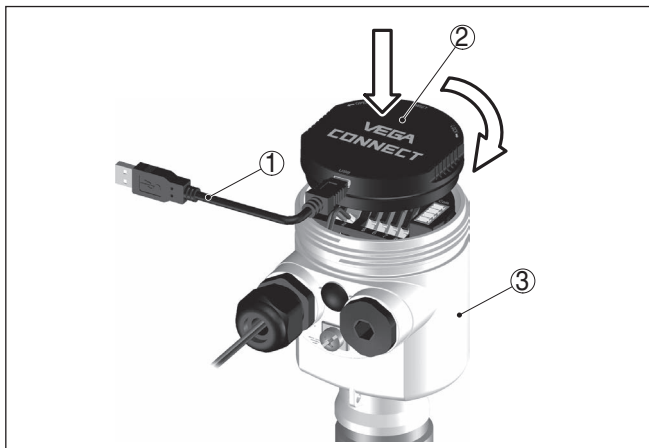


Fig. 15: Connection of the PC via VEGACONNECT directly to the sensor

- 1 USB cable to the PC
- 2 VEGACONNECT
- 3 Sensor

**VEGACONNECT externally**

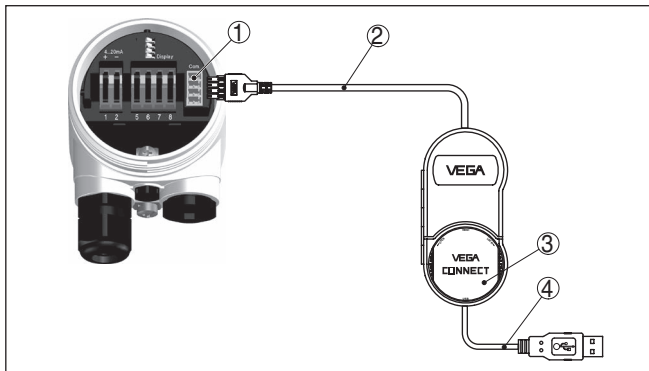


Fig. 16: Connection via VEGACONNECT externally

- 1 I²C bus (com.) interface on the sensor
- 2 I²C connection cable of VEGACONNECT
- 3 VEGACONNECT
- 4 USB cable to the PC

Necessary components:

- VEGAPULS 66
- PC with PACTware and suitable VEGA DTM

- VEGACONNECT
- Power supply unit or processing system

### Connection via HART

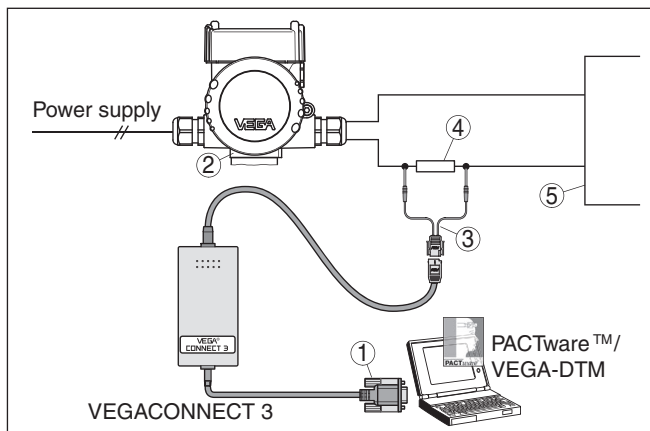


Fig. 17: Connecting the PC via HART to the signal cable

- 1 RS232 connection
- 2 VEGAPULS 66
- 3 HART adapter cable for VEGACONNECT 3
- 4 HART resistor 250  $\Omega$
- 5 4 ... 20 mA processing

Necessary components:

- VEGAPULS 66
- PC with PACTware and suitable VEGA DTM
- VEGACONNECT 3 with HART adapter cable
- HART resistor 250  $\Omega$
- Voltage supply
- 4 ... 20 mA processing



#### Note:

For processings with integrated HART resistance (inner resistance approx. 250  $\Omega$ ), there is no additional, external resistance necessary. In such cases, VEGACONNECT 3 can be connected in parallel to the 4 ... 20 mA cable.

## 7.2 Parameter adjustment with PACTware

### Prerequisites

For parameter adjustment of the instrument via a Windows PC, the configuration software PACTware and a suitable instrument driver (DTM) according to FDT standard are required. The latest PACTware version as well as all available DTMs are compiled in a DTM Collection. The DTMs can also be integrated into other frame applications according to FDT standard.



#### Note:

To ensure that all instrument functions are supported, you should always use the latest DTM Collection. Furthermore, not all described

functions are included in older firmware versions. You can download the latest instrument software from our homepage. A description of the update procedure is also available in the Internet.

Further setup steps are described in the operating instructions manual "DTM Collection/PACTware" attached to each DTM Collection and which can also be downloaded from the Internet. Detailed descriptions are available in the online help of PACTware and the DTMs.

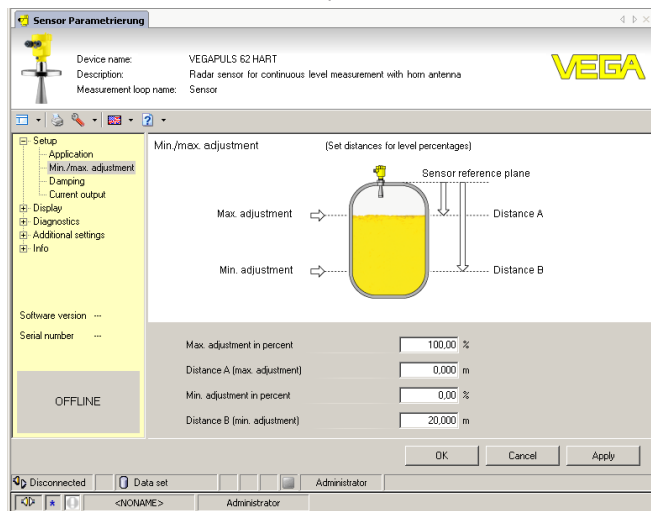


Fig. 18: Example of a DTM view

## Standard/Full version

All device DTMs are available as a free-of-charge standard version and as a full version that must be purchased. In the standard version, all functions for complete setup are already included. An assistant for simple project configuration simplifies the adjustment considerably. Saving/printing the project as well as import/export functions are also part of the standard version.

In the full version there is also an extended print function for complete project documentation as well as a save function for measured value and echo curves. In addition, there is a tank calculation program as well as a multiviewer for display and analysis of the saved measured value and echo curves.

The standard version is available as a download under [www.vega.com/downloads](http://www.vega.com/downloads) and "Software". The full version is available on CD from the agency serving you.

## 7.3 Parameter adjustment with AMS™ and PDM

For VEGA sensors, instrument descriptions for the adjustment programs AMS™ and PDM are available as DD or EDD. The instrument descriptions are already implemented in the current versions of AMS™ and PDM.

For older versions of AMS™ and PDM, a free-of-charge download is available via Internet. Move via [www.vega.com](http://www.vega.com) and "Downloads" to "Software".

## **7.4 Saving the parameter adjustment data**

It is recommended to document or save the parameter adjustment data. That way they are available for multiple use or service purposes.

The VEGA DTM Collection and PACTware in the licensed, professional version provide suitable tools for systematic project documentation and storage.



## 8 Maintenance and fault rectification

### 8.1 Maintenance

If the instrument is used properly, no special maintenance is required in normal operation.

### 8.2 Rectify faults

#### Reaction when malfunction occurs

The operator of the system is responsible for taking suitable measures to rectify faults.

#### Causes of malfunction

VEGAPULS 66 offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

#### Fault rectification

The first measures to be taken are to check the output signals as well as to evaluate the error messages via the display and adjustment module. The procedure is described below. Further comprehensive diagnostics can be carried out on a PC with the software PACTware and the suitable DTM. In many cases, the causes can be determined and the faults rectified this way.

#### 24 hour service hotline

Should these measures not be successful, please call in urgent cases the VEGA service hotline under the phone no. **+49 1805 858550**.

The hotline is manned 7 days a week round-the-clock. Since we offer this service worldwide, the support is only available in the English language. The service is free, only standard call charges are incurred.

#### Check the 4 ... 20 mA signal

Connect a multimeter in the suitable measuring range according to the wiring plan. The following table describes possible errors in the current signal and helps to eliminate them:

Error	Cause	Rectification
4 ... 20 mA signal not stable	Level fluctuations	Set damping via the display and adjustment module
4 ... 20 mA signal missing	Electrical connection faulty	Check connection according to chapter "Connection steps" and if necessary, correct according to chapter "Wiring plan"
	Voltage supply missing	Check cables for breaks; repair if necessary
	Operating voltage too low or load resistance too high	Check, adapt if necessary
Current signal greater than 22 mA or less than 3.6 mA	Electronics module in the sensor defective	Exchange the instrument or send it in for repair



In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

### Error messages via the display and adjustment module

Error code	Cause	Rectification
E013	no measured value available	<ul style="list-style-type: none"> <li>– Sensor in boot phase</li> <li>– Sensor does not find an echo, e.g. due to faulty installation or wrong parameter adjustment</li> </ul>
E017	Adjustment span too small	<ul style="list-style-type: none"> <li>– Carry out a fresh adjustment and increase the distance between min. and max. adjustment</li> </ul>
E036	no operable sensor software	<ul style="list-style-type: none"> <li>– Carry out a software update or send instrument for repair</li> </ul>
E041, E042, E043	Hardware error, electronics defective	<ul style="list-style-type: none"> <li>– Exchange the instrument or send it in for repair</li> </ul>

### Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter "Set up" may have to be carried out again.

## 8.3 Exchanging the electronics module

If the electronics module is defective, it can be replaced by the user.



In Ex applications, only instruments and electronics modules with appropriate Ex approval may be used.

If there is no electronics module available on site, one can be ordered from the VEGA agency serving you.

### Sensor serial number

The new electronics module must be loaded with the settings of the sensor. These are the options:

- At the factory by VEGA
- Or on site by the user

In both cases, the sensor serial number is necessary. The serial numbers are stated on the type label of the instrument, inside the housing or on the delivery note.



#### Information:

When loading on site, first of all the order data must be downloaded from the Internet (see operating instructions manual "*Electronics module*").

### Assignment

The electronics modules are adapted to the respective sensor and distinguish also in the signal output or power supply.

## 8.4 Software update

The following components are required to update the instrument software:

- Instrument
- Voltage supply
- Interface adapter VEGACONNECT

- PC with PACTware
- Current instrument software as file

You can find the current instrument software as well as detailed information on the procedure under "[www.vega.com/downloads](http://www.vega.com/downloads)" and "*Software*".



**Caution:**

Instruments with approvals can be bound to certain software versions. Therefore make sure that the approval is still effective after a software update is carried out.

You can find detailed information at [www.vega.com/downloads](http://www.vega.com/downloads) and "*Approvals*".

## 8.5 How to proceed if a repair is necessary

You can find a repair form as well as detailed information on how to proceed at [www.vega.com/downloads](http://www.vega.com/downloads) and "*Forms and certificates*".

By doing this you help us carry out the repair quickly and without having to call back for needed information.

If a repair is necessary, please proceed as follows:

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and, if need be, also a safety data sheet outside on the packaging
- Please contact the agency serving you to get the address for the return shipment. You can find the agency on our home page [www.vega.com](http://www.vega.com).

## 9 Dismount

### 9.1 Dismounting steps

**Warning:**

Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel or pipeline, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

### 9.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the parts to be easily separable.

**WEEE directive 2002/96/EG**

This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws. Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

Correct disposal avoids negative effects on humans and the environment and ensures recycling of useful raw materials.

Materials: see chapter "*Technical data*"

If you have no way to dispose of the old instrument properly, please contact us concerning return and disposal.

## 10 Supplement

### 10.1 Technical data

#### General data

316L corresponds to 1.4404 or 1.4435

Materials, wetted parts

- Process fitting 316L, Alloy C22 (2.4602) plated
- Antenna 316L, Alloy C22 (2.4602)
- Antenna cone PTFE (TFM 1600), ceramic (99.7 %  $Al_2O_3$ )
- seal, antenna system FKM (A+P GLT FPM 70.16-06), FFKM (Kalrez 6375), silicone FEP coated (A+P FEP-O-Seal) Viton, EPDM (FDA approved), graphite
- Standpipe 316L, Alloy C22 (2.4602)

Materials, non-wetted parts

- Housing Aluminium die-casting powder coated, 316L
  - Seal between housing and housing cover NBR (stainless steel housing), silicone (Aluminium housing)
  - Inspection window in housing lid for display and adjustment module Polycarbonate (UL-746-C listed)
  - Ground terminal 316Ti/316L
- Ohmic contact Between ground terminal, process fitting and standpipe

Weight without standpipe, depending on flange size, pressure stage and housing material 6.3 ... 136 kg (13.89 ... 299.8 lbs)

Weight, standpipe 3.2 kg/m (2.2 lbs/ft)

Length standpipe antenna max. 5.85 m (19.19 ft)

#### Output variable

- |  |  |
|--|--|
| Output signal                              | 4 ... 20 mA/HART (active)                                |
| Cycle time                                 | min. 1 s (dependent on the parameter setting)            |
| Signal resolution                          | 1.6 $\mu A$  |
| Failure signal current output (adjustable) | mA value unchanged 20.5 mA, 22 mA, < 3.6 mA (adjustable) |
| Max. output current                        | 22 mA  |
| Load                                       | < 500 $\Omega^{(8)}$                                     |
| Damping (63 % of the input variable)       | 0 ... 999 s, adjustable                                  |
| Met NAMUR recommendation                   | NE 43  |
| HART output values                         |  |
| – 1. HART value (Primary Value)            | Distance to the level                                    |
| – 2. HART value (Secondary Value)          | Distance to the level - scaled (for example hl, %)       |
| Resolution, digital                        | > 1 mm (0.039 in)  |

<sup>(8)</sup> With inductive load ohmic share min. 25  $\Omega$ /mH.

### Input variable

Measured variable	Distance between lower edge of the sensor flange and product surface
Min. distance	0 mm
Measuring range	up to 5.85 m (19.19 ft) <sup>9)</sup>

### Reference conditions to measuring accuracy (according to DIN EN 60770-1)

Reference conditions according to DIN EN 61298-1

– Temperature	+18 ... +30 °C (+64 ... +86 °F)
– Relative humidity	45 ... 75 %
– Air pressure	860 ... 1060 mbar/86 ... 106 kPa (12.5 ... 15.4 psig)

Other reference conditions

– Reflector	ideal reflector, e.g. metal plate 2 x 2 m
– False reflections	Biggest false signal, 20 dB smaller than the useful signal

### Characteristics and performance data

Measuring frequency	C-band (6 GHz technology)
Step response or adjustment time <sup>10)</sup>	> 1 s (dependent on the parameter setting)
Max. level change	adjustable up to 1 m/min. (dependent on the parameter adjustment)

Max. emitted HF power of the antenna system

– Pulse peak power approx.	0.1 mW
– Pulse duration	< 2 ns
– SAR value <sup>11)</sup>	0.471 mW/kg

### Measuring accuracy

Resolution, general	max. 1 mm (0.039 in)
Deviation <sup>12)</sup>	see diagrams

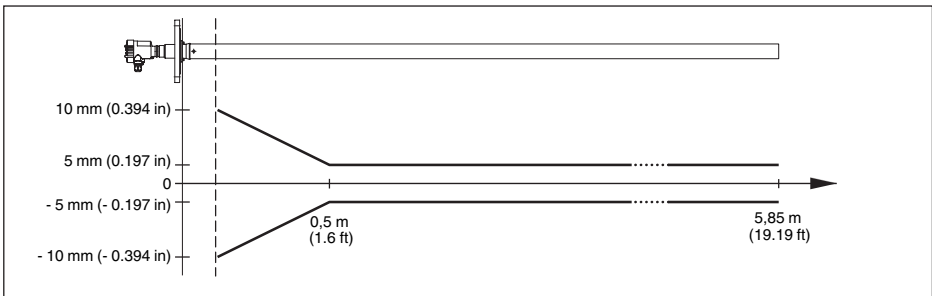


Fig. 19: Deviation VEGAPULS 66 standpipe

<sup>9)</sup> According to the respective standpipe length.

<sup>10)</sup> Time to output the correct level (with max. 10 % deviation) after a sudden level change.

<sup>11)</sup> at the aperture of a horn antenna with  $\varnothing$  150 mm

<sup>12)</sup> Incl. non-linearity, hysteresis and non-repeatability.

## Influence of the ambient temperature to the sensor electronics<sup>13)</sup>

Average temperature coefficient of the zero signal (temperature error) 0.03 %/10 K

## Influence of the superimposed gas and pressure to the accuracy

The spreading speed of the radar impulses in gas or vapour above the product is reduced by high pressures. This effect depends on the superimposed gas or vapour and increases with low temperatures. The following chart shows the deviation caused by some typical gases or vapours. The stated values refer to the distance. Positive values mean that the measured distance is too high, negative values that the measured distance is too small.

Gas phase	Temperature	1 bar/14.5 psig	10 bar/145 psig	50 bar/725 psig
Air/Nitrogen	20 °C/68 °F	0.00 %	0.22 %	1.2 %
Air/Nitrogen	200 °C/392 °F	0.00 %	0.13 %	0.74 %
Hydrogen	20 °C/68 °F	-0.01 %	0.10 %	0.61 %
Hydrogen	200 °C/392 °F	-0.02 %	0.05 %	0.37 %
Water (saturated steam)	100 °C/212 °F	0.20 %	-	-
Water (saturated steam)	180 °C/356 °F	-	2.1 %	-

## Ambient conditions

Ambient, storage and transport temperature -40 ... +70 °C (-40 ... +158 °F)

## Process conditions

For the process temperature and the vessel pressure, you also have to note the specifications on the type label! Always the lowest value is applicable!

Process temperature (measured on the process fitting depending on process seal)

- FKM (A+P GLT FPM 70.16-06) -40 ... +150 °C (-40 ... +302 °F)
- FFKM (Kalrez 6375) -20 ... +150 °C (-4 ... +302 °F)
- Silicone FEP coated (A+P FEP-O-Seal) Viton -40 ... +150 °C (-40 ... +302 °F)
- EPDM (A+P 75.5/KW75F, FDA approval) -40 ... +150 °C (-40 ... +302 °F)
- graphite (coupling cone ceramic) -60 ... +250 °C (-76 ... +482 °F)
- graphite (coupling cone ceramic) with temperature adapter -60 ... +400 °C (-76 ... +752 °F)

Vessel pressure relating to the antenna cone

- PTFE -100 ... 4000 kPa/-1 ... 40 bar (-14.5 ... 580 psi) with PN 40
- Ceramic -100 ... 16000 kPa/-1 ... 160 bar (-14.5 ... 2321 psi) with PN 160

<sup>13)</sup> Relating to the nominal measuring range, in the temperature range -40 ... +80 °C .

Vessel pressure relating to the flange nominal pressure stage	see supplementary instructions manual " <i>Flanges according to DIN-EN-ASME-JIS</i> "
Vibration resistance	mechanical vibrations with 1 g and 5 ... 100 Hz <sup>14)</sup>

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**Electromechanical data - version IP 66/IP 67**


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**Cable entry**

- |                          |   |
|--------------------------|---|
| – Double chamber housing | – 1 x cable gland M20 x 1.5 (cable: ø 5 ... 9 mm), 1 x blind plug M20 x 1.5; plug M12 x 1 for VEGADIS 61 (optional) |
|                          | or:   |
|                          | – 1 x closing cap ½ NPT, 1 x blind plug ½ NPT, plug M12 x 1 for VEGADIS 61 (optional)                               |
|                          | or:   |
|                          | – 1 x plug (depending on the version), 1 x blind plug M20 x 1.5; plug M12 x 1 for VEGADIS 61 (optional)             |

Spring-loaded terminals for wire cross-section	< 2.5 mm <sup>2</sup> (AWG 14)
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**Display and adjustment module**


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Voltage supply and data transmission	through the sensor
Indication	LC display in dot matrix
Adjustment elements	4 keys
Protection rating	
– unassembled	IP 20
– mounted into the sensor without cover	IP 40
Material	
– Housing	ABS
– Inspection window	Polyester foil

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**Voltage supply**


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Operating voltage	
– Non-Ex and Ex-d instrument	20 ... 72 V DC, 20 ... 253 V AC, 50/60 Hz
Max. power consumption	4 VA; 2.1 W

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**Electrical protective measures**


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Protection rating	IP 66/IP 67 (NEMA 4X)
Overvoltage category (IEC 61010-1)	
– up to 2000 m (6562 ft) above sea level	III
– up to 5000 m (16404 ft) above sea level	III - Only with connected overvoltage protection
– up to 5000 m (16404 ft) above sea level	II
Protection rating (IEC 61010-1)	I

<sup>14)</sup> Tested according to the guidelines of German Lloyd, GL directive 2.



## Functional safety (SIL)

Functional safety is already activated on instruments with SIL qualification ex factory. On instruments without SIL qualification ex factory, the functional safety must be activated by the user via the display and adjustment module or via PACTware for applications according to SIL.

Functional safety according to IEC 61508-4

- Single channel architecture (1oo1D) up to SIL2
- double channel diversitary redundant architecture (1oo2D) up to SIL3

You can find detailed information in the supplied Safety Manual of the instrument series or under "[www.vega.com](http://www.vega.com)", "[Downloads](#)", "[Approvals](#)".

## Approvals

Instruments with approvals can have different technical specifications depending on the version.

For that reason the associated approval documents of these instruments have to be carefully noted. They are part of the delivery or can be downloaded under [www.vega.com](http://www.vega.com) via "[VEGA Tools](#)" and "[Instrument search](#)" as well as via "[Downloads](#)" and "[Approvals](#)".

## 10.2 Dimensions

### Housing

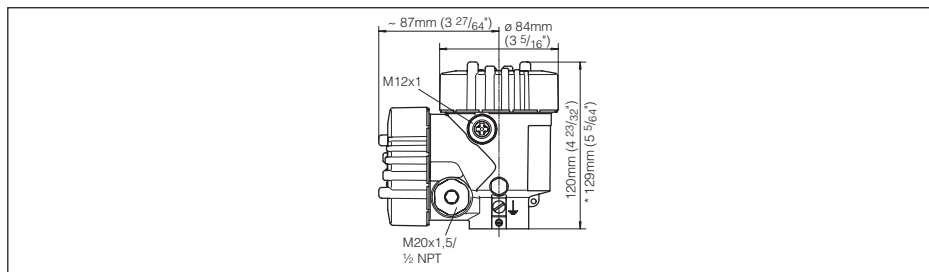
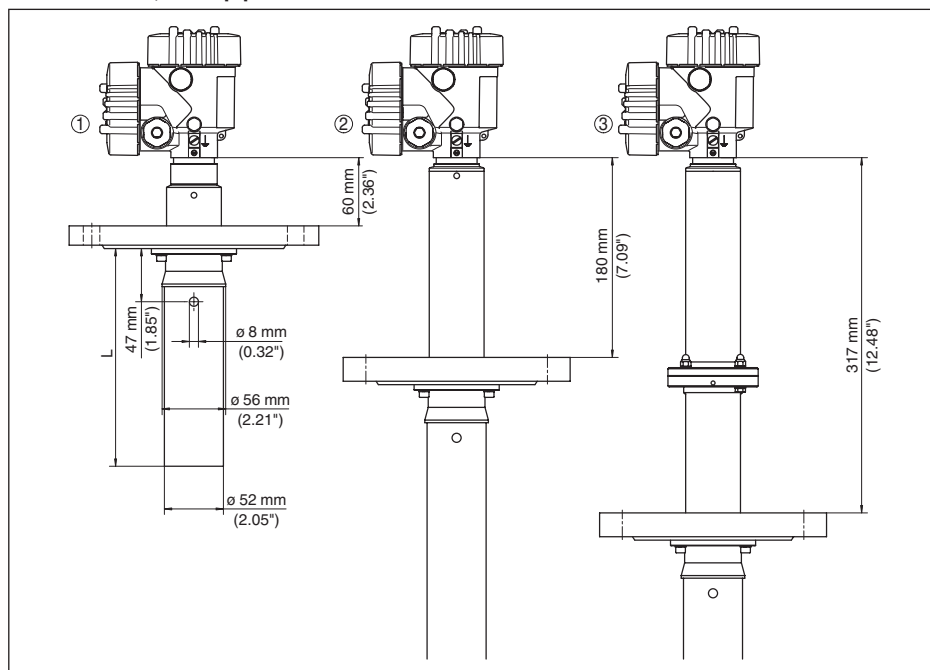


Fig. 20: Double chamber housing of Aluminium or stainless steel (with integrated display and adjustment module the housing is 9 mm/0.35 in higher)

**VEGAPULS 66, standpipe version**Fig. 21: VEGAPULS 66, standpipe version<sup>15)</sup>

- 1 Standard version
- 2 High temperature version -60 ... +250 °C (-76 ... +482 °F)
- 3 High temperature version -60 ... +400 °C (-76 ... +752 °F)

<sup>15)</sup> The plant operator must provide a suitable support for the standpipe depending on the length and the process conditions.

## 10.3 Industrial property rights

VEGA product lines are global protected by industrial property rights. Further information see [www.vega.com](http://www.vega.com).

Only in U.S.A.: Further information see patent label at the sensor housing.

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进一步信息请参见网站<[www.vega.com](http://www.vega.com)。

## 10.4 Trademark

All the brands as well as trade and company names used are property of their lawful proprietor/originator.

# VEGA

Printing date:

All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

Subject to change without prior notice

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